

DESIGN NOTES

Specifications:

Design:
Bridge Design Specification (1983 AASHTO Specifications with revisions by Caltrans)
Load Factors: $1.5 D + 1.5 E + 2.5 (L + I)$
Where
D=Dead Load
E=Earth Load
L=Live Load
I=Impact
Capacity reduction factor is included.

Loading:

Live loads:
HS20-44 truck
Apply impact only to the roof slab.

Earth Cover (mm)	Impact (%)
Up to 300	30
301 to 600	20
601 to 900	10
Over 900	0

No surcharge on walls due to live load.

Earth loads:

Earth pressures for two conditions:
22.0 kPa/m vertical, 6.6 kPa/m horizontal,
22.0 kPa/m vertical, 22.0 kPa/m horizontal.

Unit stresses:

$f_c = 25 \text{ MPa}$
 $f_y = 400 \text{ MPa}$

Distribution "d" bars:

Up to and including 3.0 m cover
Expressed as a percent of main positive reinforcement
required: 100%, max 50%.

$0.05126/\sqrt{s}$

Over 3.0 m cover:

#13 @ 450 mm maximum.

Shear:

Maximum allowable shear, $v_c = 0.29\sqrt{f'_c}$, MPa

Exclusions:

Compressive reinforcement and negative-moment
reduction (for continuity) do not apply.
Axial loading on members has not been considered.

CONSTRUCTION NOTES

Construction loads:

Strutting required as shown on Standard Plan D88.
Strutting may be required on culvert extensions
when existing parapet is removed.

Expansion joints:

Invert:

No expansion joints shall be permitted.

Roof and Walls:

When cover is less than span length:
Place 13 mm expansion joint filler at 9 m± centers
outside the paved roadway lanes and place Bridge
Detail 3-2, Standard Plan B0-3, at 9 m centers under
paved roadway lanes.

When cover is more than span length:

Place 13 mm expansion joint filler at 9 m± centers and
additional 13 mm expansion joints at locations of change
in foundation character, as directed by the Engineer.

Construction joints:

Temporary joints may be permitted if normal (or radial) to
line of RCB. Otherwise, the contractor is to submit a
proposal for consideration.

Cutoff walls:

1.2 m cutoff walls are to be provided at inlet and/or outlet
unless adjacent channel is lined and unless otherwise shown.
These walls are to be extended if scour conditions warrant.

Earthwork:

See Standard Plan A62E.

Backfill:

See Standard Specifications, except that the difference
in level of backfill (against outside walls) shall not exceed
600 mm.

Height	Cover 3 m	6 m
1830 mm	95	150
2440 mm	105	160
3050 mm	115	170
3660 mm	125	180
4270 mm	135	190

DESIGN BEARING
PRESSURE (kPa)

GENERAL NOTES

Designations:

Standard single or multiple box culverts are shown on
plans as span times height with maximum cover over
roof thus: 2440 mm x 1520 mm RCB with 3 m or
DBL 3050 mm x 1520 mm RCB with 6 m, followed by
alternatives.

Alternatives:

Single cell invert will be sloped unless "trapezoidal
invert", "flat invert" or "V invert" is included in
designation.

Multiple cell invert will be vee unless "flat invert" is
specified. Ends of culvert will be rounded unless
"square ends" are designated. Parapets will be as
shown unless designated in plans. Such designations
may be different for inlet and outlet ends.

Quantities:

Quantities are for the sloped or vee invert and
do not include "d" bars, nor splices in longitudinal
bars, nor temperature reinforcement for exposed
roof, nor concrete or reinforcement for parapets,
cutoff walls or paving notches.

Reinforcement placement:

Main reinforcement is to be placed transverse or,
for curved culverts, radial. When radial, reinforcing
spacing of the "a", "f" and "g" bars is measured along
the centerline. Stagger splices not shown. Hooks
may be rotated or tilted, as necessary, for clearance.

Special reinforcement coverage:

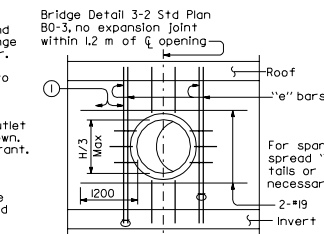
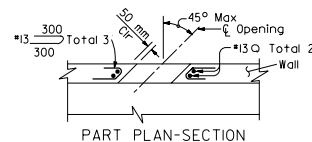
Box standard plans are not to be used for culverts in
a corrosive environment or where there is a severe
abrasive flow condition or in freeze-thaw locations.

Special design:

Required for culverts with conditions, loads, design bearing
pressures or sizes greater than those given on this plan or
Standard Plans D80 & DBL. Also required for multiple cell
culverts with unequal spans. For culverts with railroad
loading, see the current AREA design specification.

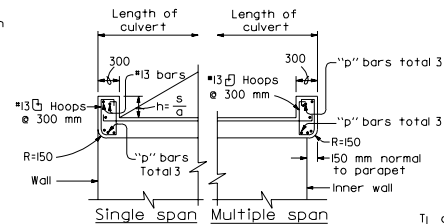
3 or more cells:

For culverts with more than two cells, use dimensions
and reinforcement for the standard "double box
culvert" and adjust quantities accordingly.



LONGITUDINAL SECTION
UTILITY OPENING-WALL
H= Height of box

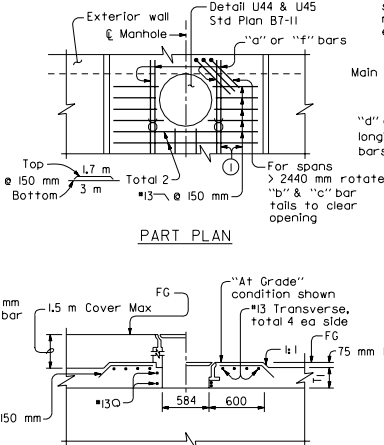
① Adjacent to each side of the opening,
place additional bars equivalent to half
the interrupted main reinforcement.



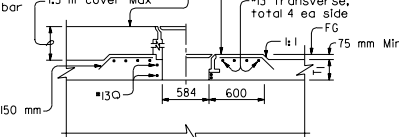
PARAPET DETAIL
s = Clear span (mm)
a = 12 cosine skew angle

Span	Parapet "p" bars			
	Skew Angle	To 10°	To 30°	To 45°
1220 mm	#13	#13	#13	
1830 mm	#13	#13	#16	
2440 mm	#13	#16	#19	
3050 mm	#16	#19	#22	
3660 mm	#19	#22	#25	
4270 mm	#22	#25	#29	

PARAPET
REINFORCEMENT



PART PLAN

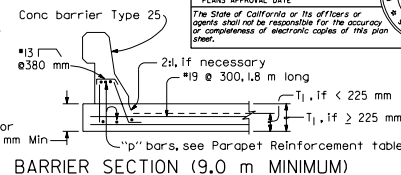


PART LONGITUDINAL SECTION

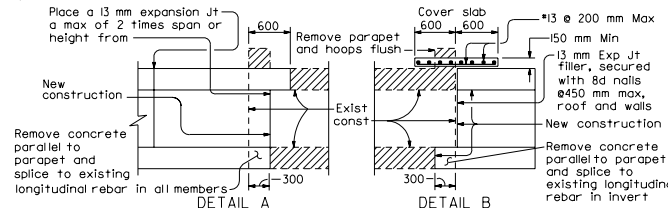
MANHOLE



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET TOTAL NO. SHEETS
Paul Cotter REGISTERED CIVIL ENGINEER July 1, 1999 PLANS APPROVAL DATE The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet. Paul Cotter No. 34509 CIVIL STATE OF CALIFORNIA LICENSED PROFESSIONAL ENGINEER				

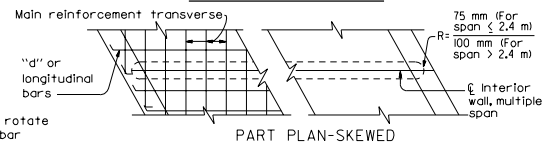


BARRIER SECTION (9.0 m MINIMUM)

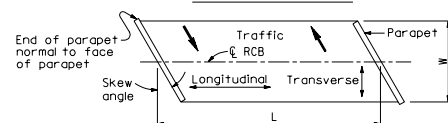


(20° maximum skew as shown, if existing longitudinal and transverse reinforcing bars in top slab are lap covered with new longitudinal and transverse reinforcing bars, the 20° skew may be exceeded, lap splicing may require removal of top slab in excess of 600 mm shown.)

CULVERT EXTENSION



PART PLAN-SKEWED



RCB TERMINOLOGY

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**CAST-IN-PLACE REINFORCED
CONCRETE BOX CULVERT
MISCELLANEOUS DETAILS**

NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN

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